The Impact of Infectious Disease-Related Public Health Emergencies on Suicide, Suicidal Behavior, and Suicidal Thoughts

The impact of infectious disease-related public health emergencies on suicide, suicidal behavior, and suicidal thoughts: A systematic review

Abstract

Background: Infectious disease-related public health emergencies (epidemics) may increase suicide risk, and high-quality evidence is needed to guide an international response. **Aims:** We investigated potential impacts of epidemics on suicide-related outcomes. **Method:** We searched MEDLINE, EMBASE, PsycInfo, CINAHL, Scopus, Web of Science, PsyArXiv, medRxiv, and bioRxiv from inception to May 13-16, 2020. Inclusion criteria: primary studies, reviews, and meta-analyses; reporting the impact of epidemics; with a primary outcome of suicide, suicidal behavior, suicidal ideation, and/or self-harm. Exclusion criteria: not concerned with suicide-related outcomes; not suitable for data extraction. PROSPERO registration: #CRD42020187013. **Results:** Eight primary papers were included, examining the effects of five epidemics on suicide-related outcomes. There was evidence of increased suicide rates among older adults during SARS and in the year following the epidemic (possibly motivated by social disconnectedness, fears of virus infection, and concern about burdening others) and associations between SARS/Ebola exposure and increased suicide attempts. A preprint study reported associations between COVID-19 distress and past-month suicidal ideation. **Limitations:** Few studies have investigated the topic; these are of relatively low methodological quality. **Conclusions:** Findings support an association between previous epidemics and increased risk of suicide-related outcomes. Research is needed to investigate the impact of COVID-19 on suicide risk.

Keywords: Pandemics; Epidemics; COVID-19; Suicide; Self-harm

Suicide prevention is a crucial public health priority (World Health Organization, 2018). Key risk factors for suicide include psychological and social stressors, adverse life events, feeling trapped, life transitions and losses, physical illness, and mental disorders (Fazel & Runeson, 2020). Infectious disease-related public health emergencies are notable in that they simultaneously increase the presence and severity of multiple risk factors and, accordingly, some evidence suggests that they may have a greater impact on suicide rates than other catastrophic global events such as World Wars (Wasserman, 1992). It has therefore been hypothesized that the COVID-19 pandemic may increase suicide rates (Gunnell et al., 2020; Reger, Stanley, & Joiner, 2020). It is also possible that an enhanced sense of belonging, resilience, and social connectedness or of finding meaning in the context of adversities like a global pandemic could potentially have the opposite impact, protecting against suicide (O'Connor & Kirtley, 2018; Reger et al., 2020).

Several specific features of the COVID-19 pandemic could contribute to suicide risk including prolonged quarantine, widespread societal fear, severe economic stress, medical equipment shortages, decreased access to mental healthcare, and the direct effect of coronavirus itself on the brain (Brooks et al., 2020; Gunnell et al., 2020; Reger et al., 2020; Rogers et al., 2020).

Specific populations such as young people, older adults, and frontline healthcare workers may be particularly vulnerable to the psychological impact of infectious outbreaks such as the COVID-19 pandemic (Kisely et al., 2020; Reger et al., 2020). However, these conjectures are as yet unconfirmed given the absence of relevant data.

Expert recommendations propose increasing virtual connection for social support and healthcare delivery, increasing access to mental health care including evidence-based treatments for suicide, governmental financial safety nets, targeted means restriction interventions, and responsible media reporting that avoids stoking fear and hopelessness

(Gunnell et al., 2020; Reger et al., 2020). Although this guidance is concordant with general recommendations for suicide prevention (Zalsman et al., 2016) specific recommendations should ideally incorporate evidence of the impact of pandemics on suicide and associated risk-reduction initiatives. There is therefore an urgent need for high-quality evidence to guide a proactive international response to the pandemic (Holmes et al., 2020).

The aim of this systematic review is to aggregate the existing evidence on the potential impact of infectious disease-related public health emergencies (referred to here as epidemics) on suicide-related outcomes (for full list of research questions, see the Electronic Supplementary Material). Given the anticipated dearth of research in this area, outcomes of interest include suicide death and related proxy outcomes, including non-fatal suicidal behavior, self-harm, and suicidal ideation. This review strives to achieve two key goals: 1) to facilitate dissemination of the best available knowledge to inform ongoing suicide prevention initiatives during the pandemic; 2) to identify key gaps in the literature to guide the research community in prioritizing studies that could have maximum impact on suicide prevention.

Methods

Protocol and reporting guidelines

The protocol for this systematic review was registered through PROSPERO (record ID CRD42020187013) and the Open Science Framework (https://osf.io/7hzu5/). We followed the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) reporting guidelines for systematic reviews and the Synthesis Without Meta-Analysis (SWiM) complementary checklist.

Search strategy

Two research teams initially conducted independent searches (S1/S2 and S4) of the literature (see Figures A and B in the Electronic Supplementary Material) before learning of one another's efforts and opting to consolidate into a single, unified consortium. A new search (S3), encompassing both teams' prior searches, was conducted, and is referred to as the main search. A targeted grey literature search (S2) was also conducted on the impact of the COVID-19 pandemic on suicide-related outcomes. Initially, one of the teams conducted a complementary search of systematic reviews on HIV/AIDS outbreaks and suicide-related outcomes, but this was ultimately omitted from the review because it was determined that HIV/AIDS is fundamentally and mechanistically different from other, more rapidly-spreading epidemics.

Eligibility criteria

For the main search, eligibility was determined with the following inclusion criteria: (1) peer-reviewed primary studies, reviews, and meta-analyses, of any design or type, (2) reporting the impact of any infectious disease-related public health emergency (exposures), with (3) a primary outcome of suicide, suicidal behavior, suicidal ideation, and/or self-harm (conditions). There were no restrictions established for language or date of publication. Exclusion criteria were: (1) primary concern with broader mental health conditions and not suicide, (2) not reporting empirical findings suitable for data extraction (e.g., editorials, commentaries, book reviews, abstracts only), and (3) dissertations and theses.

The targeted grey literature search included any type of report from non-standard sources (e.g., preprints) which were suitable for data extraction and focused on suicide-related outcomes in relation to the COVID-19 pandemic.

Exposure and conditions

We followed the International Health Regulations (World Health Organization, 2016) definition of infectious disease-related public health emergencies: "an extraordinary event which is determined to constitute a public health risk to other states through the international spread of disease and to potentially require a coordinated international response", as it implies a "serious, sudden, unusual or unexpected" situation, which "carries implications for public health beyond the affected state's national border", and "may require immediate international action".

Suicide-related outcomes encompassed suicide, attempted suicide, suicidal thoughts/ideation, and self-harm. Suicide was defined as an intentional, fatal, and self-harmful act undertaken with at least some intent to die; attempted suicide as an intentional, non-fatal, self-harmful act undertaken with at least some intent to die; suicidal thoughts/ideation as thoughts, considerations, or contemplation of suicide (including the desire to end one's own life or the presence of suicide plans/preparations); and self-harm as any intentional, non-fatal, self-harmful act, irrespective of motivation, intention, and method (although this review excludes the following behaviors from the category of self-harm: overeating, body tattooing and/or piercing, excessive consumption of alcohol or recreational drugs, starvation arising from anorexia nervosa, or unintentional harm to oneself).

Information sources

Literature searches were conducted using the appropriate subject headings and keywords across the following databases: MEDLINE, EMBASE, PsycInfo, CINAHL, Scopus, and Web of Science. The searches were conducted between 13th and 16th May 2020 by three members of the research team (TZ, MT, CB). The grey literature search was conducted in the

following preprint platforms: PsyArXiv, medRxiv, and bioRxiv on 16th May 2020. Full search strategies for all searches are available in the Electronic Supplementary Material.

Study selection

Duplicate studies identified by our main search were crosschecked and removed, publication titles and abstracts were independently screened by six reviewers (CB, MMT, PC, NEE, HMc, MJ), and full text publications were independently assessed by six reviewers (EA, RCOC, PL, YC, SH, NEE) to determine suitability for inclusion. Ultimately, every abstract and full text was independently screened by two reviewers, and disagreements were resolved by a third reviewer (CB). Inter-rater reliability analysis for both screening stages can be found in in the Electronic Supplementary Material.

Data collection process

A proforma data extraction tool (available in Electronic Supplementary Material) was developed based on tools employed in previous systematic reviews (Zortea, Gray, & O'Connor, 2019) and adapted to fit the research questions of this present review. For each study evaluated, the following data were extracted: study characteristics and design, sample characteristics, measures/description of suicide-related outcomes, measures/description of infectious disease-related public health emergencies, and results. Information on the mechanisms and processes between exposure and condition was extracted where possible.

Quality assessment

A quality assessment framework was adapted from previous reviews (O'Connor, Ferguson, Green, O'Carroll, & O'Connor, 2016) (available in the Electronic Supplementary Material) and used to assess research design, measurement of suicide-related outcomes, relationship between infectious disease-related public health emergencies and outcomes, study sample, and whether the analyses were sufficiently powered (where power is relevant). To limit bias,

three members of the research team cross-checked the quality assessment of each article (MJ, PL, TZ).

Data synthesis and narrative review

Given heterogeneity in study designs, populations, measures, constructs, and infectious disease-related public health emergencies, it was not feasible to conduct a meta-analysis. We therefore chose to employ a narrative synthesis approach. We extracted qualitative and quantitative data according to the themes of our research questions and, mindful of distinctions in both psychological processes and consequences underpinning different modes of suicide-related outcomes (Silverman, 2006) we organized our findings according to their relevance to suicide deaths and to non-fatal suicide-related behavior.

Results

Collectively, the original study teams' searches (see Figures A and B in the Electronic Supplementary Material) and consortium main search (Figure) identified a combined total of 8413 titles and abstracts from three unique search strategies across all six databases. From this original pool, 3583 titles and abstracts were screened, 84 advanced to full-text screening, and eight primary articles plus one preprint were ultimately selected for inclusion in the systematic review. The search also identified a small number of case reports (available in the Electronic Supplementary Material). Our complementary search of grey literature yielded one preprint (Ammerman, Burke, Jacobucci, & McClure, 2020) (publication under peer-review; details available in the Electronic Supplementary Material)

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The eight primary studies investigated the impact of epidemics on suicide-related outcomes. These papers were published between 1992 and 2017 and examined the effects of epidemics which occurred between 1889 to 2016, including the Great Influenza Epidemic (Wasserman, 1992), Russian influenza (Honigsbaum, 2010), Severe Acute Respiratory Syndrome (SARS) (Chan, Chiu, Lam, Leung, & Conwell, 2006; Cheung, Chau, & Yip, 2008; Huang et al., 2005; Yip, Cheung, Chau, & Law, 2010), and Ebola Virus Disease (EVD) (Keita et al., 2017). Five of these studies focused on suicide deaths (Chan et al., 2006; Cheung et al., 2008; Honigsbaum, 2010; Wasserman, 1992; Yip et al., 2010) two on attempted suicide (Huang et al., 2005; Okusaga et al., 2011) and one on both suicidal thoughts and attempts (Keita et al., 2017). These studies were conducted in Hong Kong, Taiwan, Guinea, USA, and UK populations, and employed naturalistic observational designs, analysis of historical archives, case-comparison matched by demographics, and cross-sectional case-control methodologies. Study characteristics are summarized in Table E available in the Electronic Supplementary Material.

Infectious diseases-related public health emergencies and suicide-related outcomes

Suicide death.

Only three of the five studies which focused on suicide deaths included empirical findings; all three examined the impact of SARS on suicide deaths (Chan et al., 2006; Cheung et al., 2008; Yip et al., 2010) in older adults (age ≥ 65). Chan and colleagues (2006) reported an increase in older adult suicide rates in Hong Kong during the SARS epidemic in 2003 compared to the previous year (see Table E available in the Electronic Supplementary Material). This increase reached statistical significance for women but not for men or for those <65. The authors of the study hypothesized that a higher prevalence of pre-existing risk factors for suicide (i.e. physical health problems, marginalized social support) in older adults

may have increased their vulnerability to negative impacts of mandated social isolation and diminished access to non-emergency healthcare services.

Cheung and colleagues (2008) conducted a more comprehensive study of the same epoch. Their analyses demonstrated associations between diminished social networking during the SARS epidemic with increasing rates of older adult suicides in Hong Kong in 2003, predominantly in April (one month after the outbreak began) compared to previous reference years (1993, 1997, 1998, 2001, and 2002). This study also reported that older adult suicide rates remained elevated above pre-epidemic outbreak rates in the first year following SARS. Older individuals with terminal or severe illness represented a smaller proportion of those who died by suicide in the post-SARS period. Elevated suicide rates were also reported before and during the epidemic for older adults who were totally or partially dependent. Among those who died by suicide, the proportion of older adults who were worried about becoming sick was substantially larger during the outbreak period.

In order to identify potential contributors to older adult suicide deaths associated with the SARS epidemic, Yip and colleagues (2010) investigated suicide notes and witnesses' descriptions of the deaths by suicide of 22 individuals for whom SARS was noted as a contributing factor. Older adults who died by suicide were more likely to be afraid of contracting SARS and to have fears of disconnection from others than non-SARS-related older adult suicide decedents. Concern about burdening others was also identified as a motive for suicide. The authors reported no significant differences in sociodemographic factors, employment status, medical or psychiatric profiles, or level of dependence on others.

An additional two studies examined the impact of the Great Influenza Epidemic on American suicide death rates between 1910 and 1920 (Wasserman, 1992) and the Russian influenza on regions of the UK at the end of the 19th century (1889-1893) (Honigsbaum, 2010) respectively. Wasserman (1992) found that, after controlling for indicators of alcohol

prohibition, war, publicized suicide stories, and unemployment, the mortality rate variable (treated as an indicator of the impact of the epidemic) was positively associated with the suicide rate (estimated coefficient OLS and second order autoregressive estimate 0.10, $p < 0.05$). In the second study, Honigsbaum (2010) examined historical data available from medical officers of health and national and local newspaper reports in the UK, as well as the poetry and memoirs of prominent survivors. The findings suggested that the epidemic coincided with a marked rise in the suicide rate. Coroners' verdicts of suicide in England and Wales, of whom 60% were male, increased by 25% between 1889 and 1893, and in 1893 the suicide rate peaked at 8.5 per 100,000. No demographic differences were reported in either study.

Attempted suicide and suicidal thoughts.

The association between epidemics and attempted suicide was investigated in three studies (Huang et al., 2005; Keita et al., 2017; Okusaga et al., 2011). Huang and colleagues (2005) investigated the demographic and clinical characteristics of Emergency Department (ED) adult patients before, during and after the SARS epidemic in a SARS-dedicated hospital in Taiwan. The authors reported a correlation between overdose-related suicide attempt ED presentations and the peak-epidemic stage compared to all other (pre-, early, late, and post-) epidemic stages. Keita and colleagues (2017) examined patients who survived Ebola in Guinea between 2015 and 2016 and who received a psychiatric consultation ($n = 33$). Three patients who had been diagnosed with severe depression attempted suicide within twelve months after being discharged from the Ebola Treatment Centre, and one patient reported suicidal ideation only. Okusaga and colleagues (2011) investigated associations between attempted suicide and seropositivity for influenza (A and B) and coronaviruses among adults and found that seropositivity for influenza B was significantly associated with a history of suicide attempt(s), but not in those who had been diagnosed with influenza A or

coronaviruses. This study did not restrict its analysis to individuals contracting influenza in an epidemic context, nor did the design allow for a determination of whether infection preceded the suicide attempt.

Discussion

Summary and interpretations of findings

To our knowledge, this is the first comprehensive systematic review examining the effects of epidemics on suicide-related outcomes. Following a rigorous search of all relevant global bibliographic databases, eight primary studies were included in our review, in addition to one pre-print article and four case studies, demonstrating a paucity of literature in this area. These eight primary reports were of relatively low methodological quality (Table 1), and most failed to report statistical power. Given challenges inherent in studying public health emergencies, including an absence of baseline data and lack of experimental controls, we cannot draw a firm conclusion regarding a direct relationship between epidemics and suicide related outcomes.

Evidence exists, however, suggesting a possible impact of the 2003 SARS epidemic on suicide deaths among older adults in Hong Kong (Chan et al., 2006; Cheung et al., 2008; Yip et al., 2010), particularly for older women, individuals with more severe illnesses, and those who were totally or partially dependent upon others. Although of poorer quality, data from the Great Influenza Epidemic (Wasserman, 1992) and Russian influenza (1889-1893) also suggest an association with suicide deaths (Honigsbaum, 2010).

Ebola infection history and influenza B seropositivity were both associated with attempted suicide (Keita et al., 2017; Okusaga et al., 2011) and preprint data for the COVID-19 pandemic suggest increases in both suicidal thoughts and suicide attempts (Ammerman et al., 2020). Given the lack of baseline data in the Keita and colleagues (2017) study, however,

a causal link between the Ebola Virus Disease episode and attempted suicide cannot be assumed.

One of the research questions of the present systematic review was: What can we learn from previous infectious disease-related public health emergencies about the likely effectiveness of different interventions to mitigate the impact of the COVID-19 pandemic on suicide-related outcomes? The identified studies, however, did not examine the effectiveness of specific interventions in mitigating the impact of pandemics on the incidence of suicide-related outcomes. This highlights the urgent need for primary studies of such interventions in the context of the COVID-19 pandemic, in order to inform suicide prevention policies and clinical practice. In the meantime, national governments should strengthen their commitment to developing and implementing suicide prevention programs and activities for which there is established evidence of effectiveness (Platt & Niederkrotenthaler, 2020).

Despite methodological limitations of the studies included in the review, synthesis of the outcomes supports an association between previous infectious disease-related public health emergencies and increased risk of suicidal thoughts, behavior, and deaths. It remains to be seen whether a similar finding will emerge for COVID-19.

Pathways from public health emergencies to suicide-related outcomes

Despite the limited available evidence, there are some lessons that can be learned from previous infectious disease-related public health emergencies about the potential impact of the COVID-19 pandemic on the incidence of suicidal behavior, suicidal thoughts, and self-harm.

Four of the studies included in this review provide some, albeit limited, insight into the possible pathways leading to suicide-related outcomes. Several psychosocial processes have been reported or hypothesized, including existential anxiety or ‘dread’ associated with

media reports during the late 19th century Russian influenza outbreak in the UK (Honigsbaum, 2010) and fear/worry of contracting the virus, pessimism, helplessness, isolation, loneliness and disconnectedness (Chan et al., 2006; Cheung et al., 2008; Yip et al., 2010) linked to the SARS outbreak. Drawing on the wider literature on public health emergencies and the key features of typical government responses to such emergencies (including quarantine/physical distancing/self-isolation, restrictions on movement, travel and social interaction, and enforced closure of non-essential workplaces, educational establishments, places of worship and community meeting places), a more comprehensive list of likely negative psychosocial impacts in the exposed population can be developed. Among these constructs are several established risk factors for suicide-related outcomes, including depression, anxiety, post-traumatic stress disorder (PTSD), hopelessness, fear, unresolved anger, guilt, worthlessness, sleep problems, self-stigmatization, feelings of entrapment and burdensomeness, substance misuse, loneliness, social isolation, disconnectedness, disruption of everyday routines, unemployment, financial strain/insecurity, domestic violence, and child neglect/abuse (Cullen, Gulati, & Kelly, 2020; Dong & Bouey, 2020; James, Wardle, Steel, & Adams, 2019; Jeste, Lee, & Cacioppo, 2020; Oyesanya, Lopez-Morinigo, & Dutta, 2015; Reger et al., 2020). As many of these factors are also associated with accessing medical assistance in dying (MAID) (Castelli Drans et al., n.d.) it remains to be seen whether epidemics led to increases in MAID as well. Exploration of the psychiatric and neuropsychiatric presentations associated with severe coronavirus infections (Rogers et al., 2020; Tucci et al., 2017) highlights the frequent occurrence of delirium/confusion in the acute phase, and higher levels of depression, fatigue, insomnia, anxiety and PTSD in the post-acute phase.

The potential suicidogenic impact of public health emergencies may be greater in certain population or professional groups, in particular older adults (Chan et al., 2006;

Cheung et al., 2008; Reger et al., 2020; United Nations, 2020; World Health Organization, 2020; Yip et al., 2010), people who are or become unemployed or under-employed (Black Dog Institute, 2020; Yao, Chen, & Xu, 2020), people with pre-existing mental health and/or substance misuse problems (Black Dog Institute, 2020; Cullen et al., 2020; Yao et al., 2020), and frontline health and social care staff (Cullen et al., 2020; World Health Organization, 2020). In the absence of information on the timing of an increase in the incidence of suicide in previous infection-related public health emergencies, we have examined the evidence relating to public health emergencies arising from natural disasters. While there is no consistency in the findings over the longer term (Matsubayashi, Sawada, & Ueda, 2013), there is some evidence to suggest a short-term decrease in suicide in the immediate aftermath of a disaster. This has been labelled the "honeymoon period" (Madianos & Evi, 2010) or the "pulling together" phenomenon (Gordon, Bresin, Dombeck, Routledge, & Wonderlich, 2011). It has been claimed (Wilkinson & Pickett, 2020) that, at least in the early acute phase of the current pandemic, social connectedness, community cohesion, mutual support and caring have increased in the UK. "Pulling together" at scale, if actually present, would indeed be expected to moderate the negative psychosocial impact of COVID-19, including on suicide-related outcomes. Theory and research similarly support the role of enhancing social outreach, connection, support, and perceptions of meaning in life and of mattering to others when seeking to reduce risk for suicide ideation and behavior among older adults (Heisel & Flett, 2016; Van Orden et al., 2010); such efforts (e.g., telephone support, older befriending programs, and meaning-centered psychosocial groups) may be especially needed to help counteract the potentially negative impact of epidemics on suicide risk in later life (De Leo, Buono, & Dwyer, 2002; Heisel et al., 2020).

Strengths, limitations, and gaps

This timely review has a number of strengths, including the comprehensive list of databases and articles screened and the inclusion of a broad range of study outcomes of potential relevance to the relationship between pandemics and suicide.

The review also has a number of limitations, including a limited pool of studies and a mean quality assessment score of 3.9 out of 9 across all eight included articles. The research summarized in this review was conducted in multiple countries across different epochs, cultures, and socioeconomic conditions. Whereas this represents the best available evidence to date, the degree to which it is generalizable to the current pandemic is unclear. In particular, the recent proliferation of both social distancing as well as virtual meeting technology introduces novel variables that could help to exacerbate and/or mitigate harms with no data, as yet, to quantify any such effects. Finally, the most important limitation of the review is that it relies on an existing evidence base that is exceedingly limited, particularly when considered in view of the potential impact of the COVID-19 pandemic on mental health and suicide worldwide. For these reasons, the data presented here must be interpreted with a strong note of caution. Given that both the infectious agent and historical epoch differ between COVID-19 and prior pandemics, the impact on suicide and related-behaviors may also differ.

Given these circumstances, we suggest that a key function of this review is to identify several gaps in the literature that the research community ought to work expeditiously to address (Box). Considering the public health scale of the potential impact of epidemics on suicide-related outcomes, we believe that suicide research and prevention initiatives should be led, commissioned, and funded by local, national, and international governmental bodies, charities, and public health agencies in partnership with research centers and the private sector. Existing research methodologies and approaches might be useful to address the

research and prevention gaps, including real-time surveillance strategies (e.g., Cwik et al., 2016), ecological designs on the impact of government support/benefits (e.g., Alves, Machado, & Barreto, 2019), observational studies on mechanisms and moderating processes (e.g., Brooks et al., 2020), and community outreach and clinical intervention research designed to identify individuals at risk for suicide and to seek to intervene effectively to reduce suicide risk .

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Conclusion

This comprehensive systematic review constitutes the best available current knowledge regarding the impact of epidemics on suicide-related outcomes. Despite limitations inherent in the study of epidemics (manifested in low methodological quality of available research), the results of the current systematic review suggest a potential association between previous infectious disease-related public health emergencies and increased risk of suicidal thoughts, behavior, and deaths.

Electronic Supplementary Material

Electronic_Supplementary_Material.pdf

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